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Development of a Low-Cost, Subscale Test System to Evaluate Particle Impingement Erosion in Nozzle Ablative Materials

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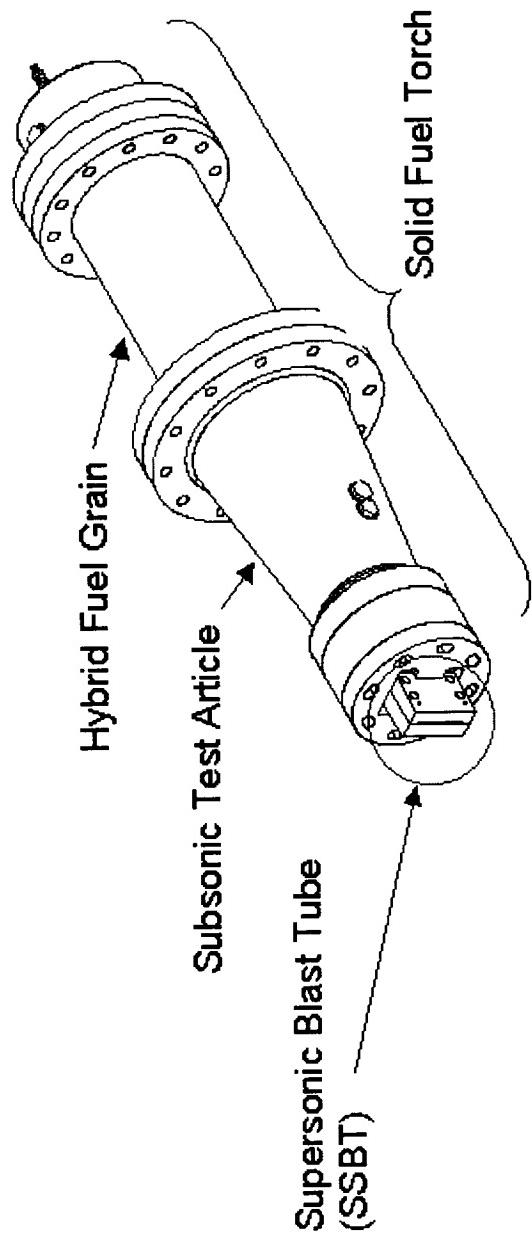
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- IDENTIFICATION OF NEED FOR NEW TEST BED
 - Observation of Ply Lifting in motors
 - Plasma Torch provided low cost testing
 - Small heating area
 - Thiokol Seventy Pound Charge test motor induced Ply Lift in test sections
 - New low cost test bed needed for Ply Lift testing
 - Solid Fuel Torch (SFT) development began with Thiokol



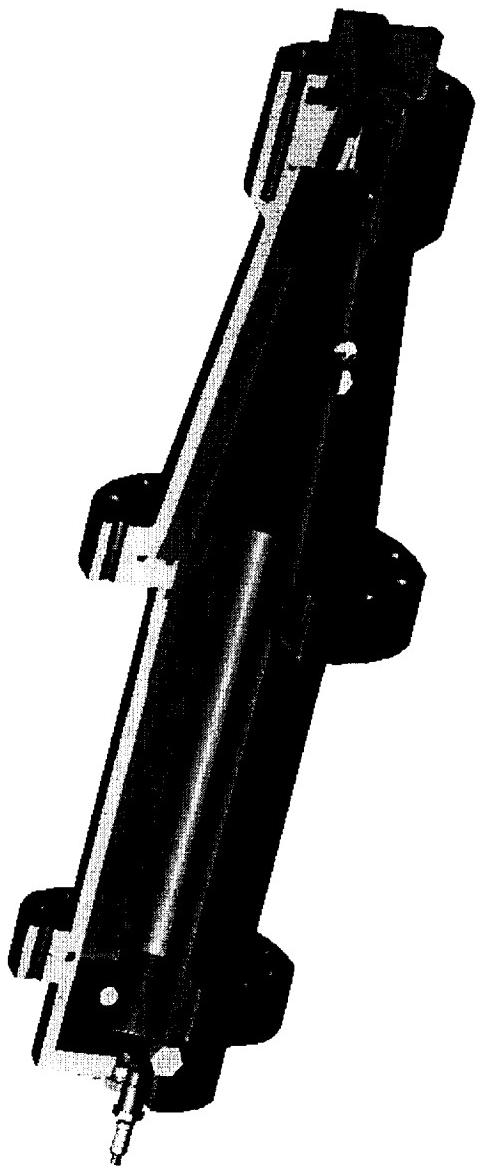
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SOLID FUEL TORCH COMPONENTS



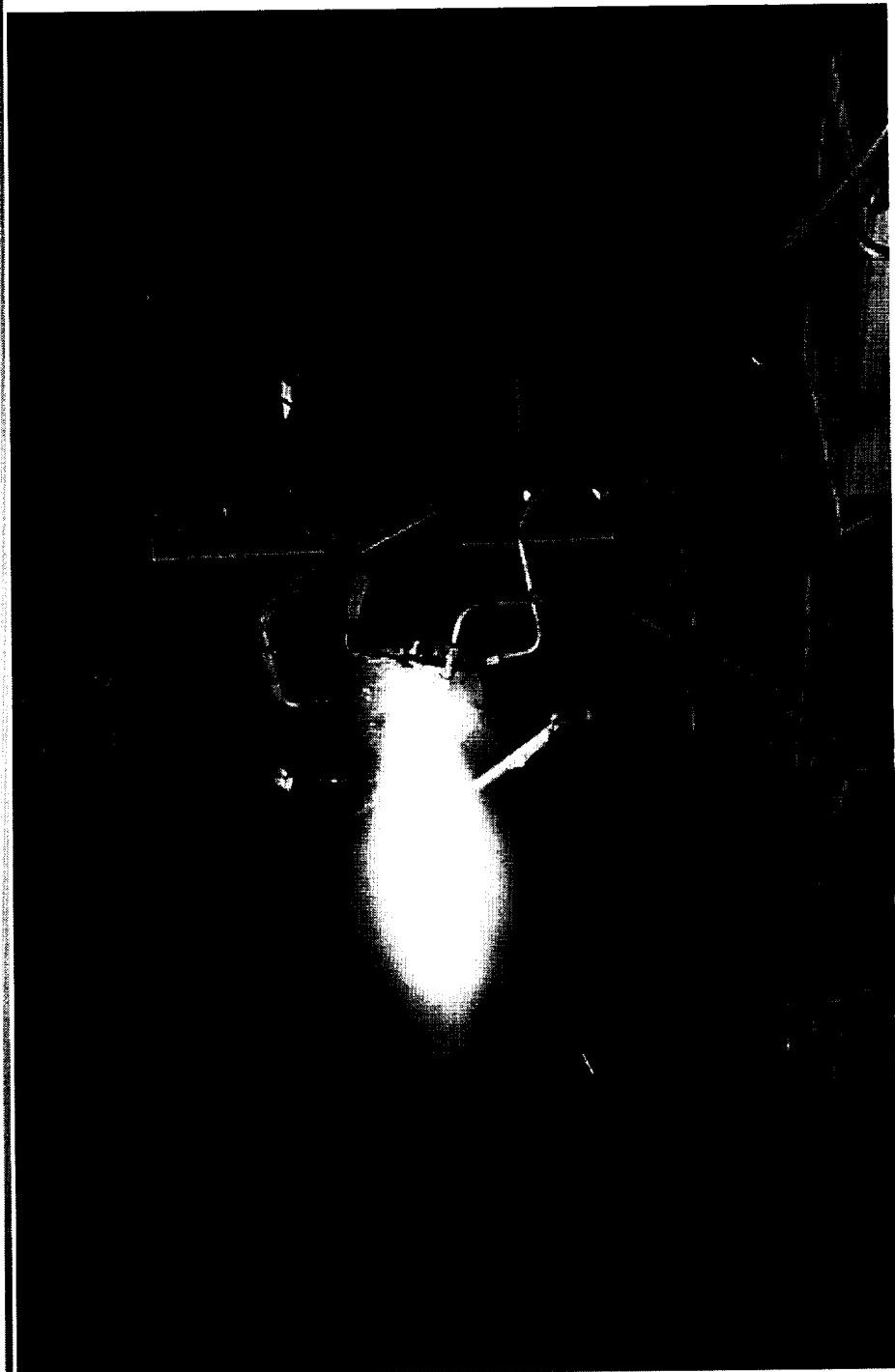
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SOLID FUEL TORCH CUT-AWAY



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SOLID FUEL TORCH TEST



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- DEVELOPMENT EVOLVED ADDITIONAL USES
 - Ply Lift issue overtaken by other/higher priorities
 - Maturing SFT used to evaluate several joint issues for RSRM
 - Nozzle to Case Joint polysulfide gas paths
 - Throat to Forward Exit Cone Joint study of void volumes and o-ring burning
 - Identified need for supersonic test with particle impingement
 - Operating parameters of SFT already characterized



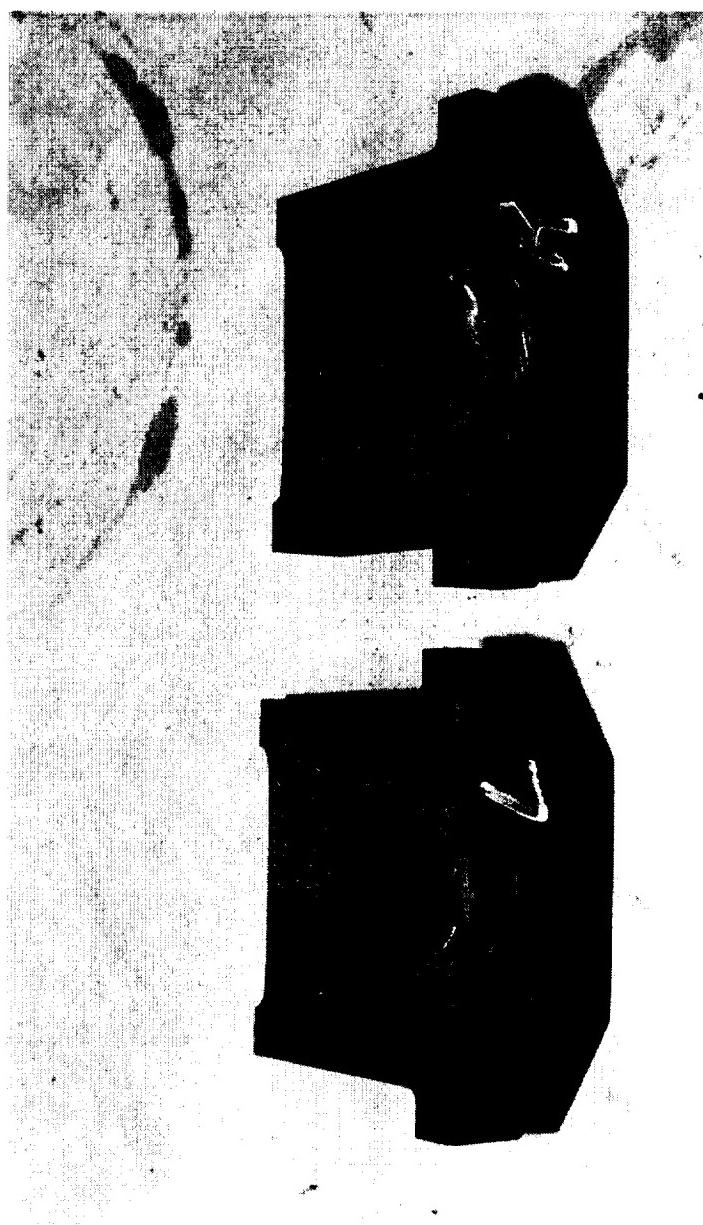
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- DEVELOPMENT OF SUPERSONIC BLAST TUBE (SSBT)
 - NASA and Thiokol performed iterative design for expansion/contraction of SSBT contours
 - Demonstrated performance with 0%, 18%, and 36% Al
 - Low C* Efficiency at 36% Al
 - Subsequent testing at 26% Al resulted in unacceptable pressure fluctuations
 - Accepted 18% Al as standard
 - Demonstrated particle impingement capability for material discrimination



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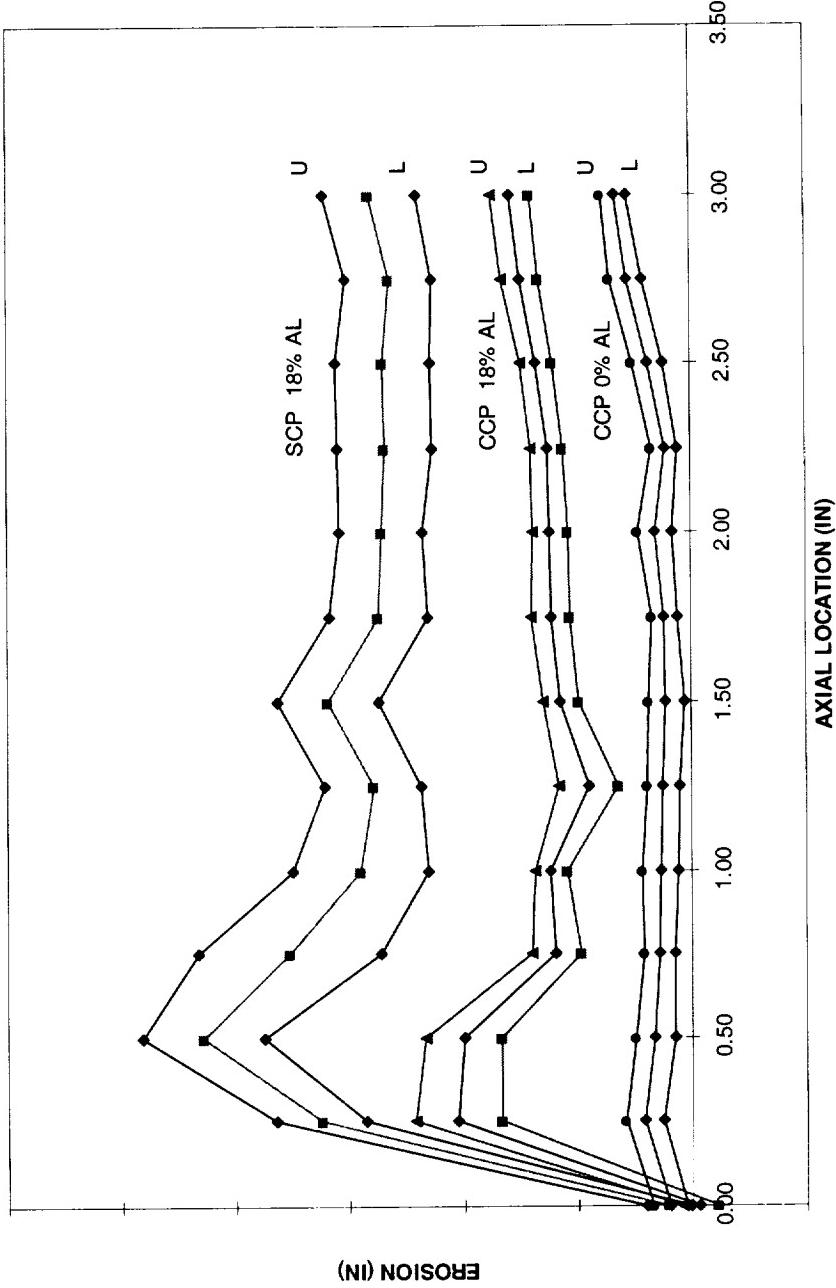


SFT #125 SSBT #52
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SUPersonic BLAST TUBE (SSBT)



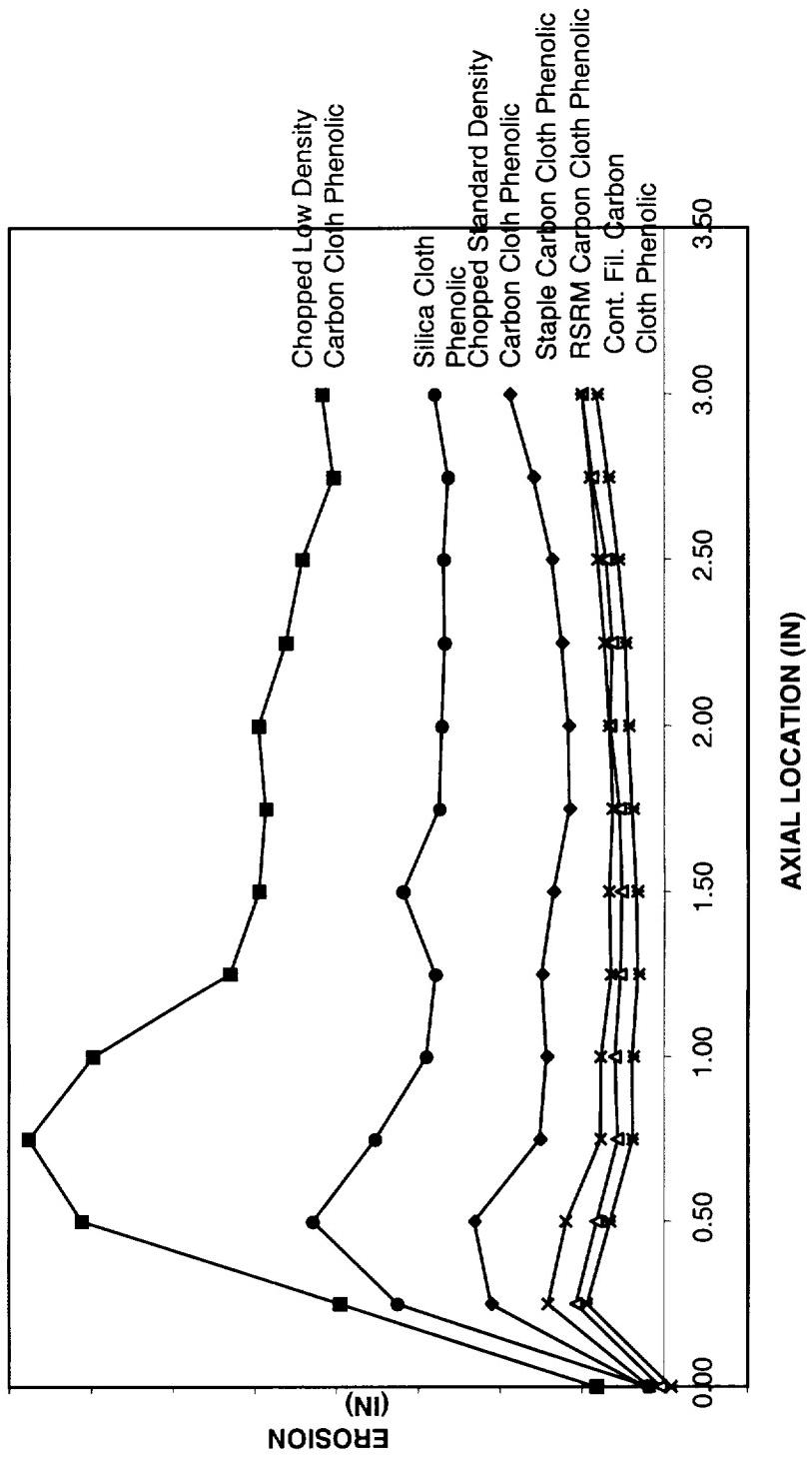
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PARTICLE IMPINGEMENT MATERIAL DISCRIMINATION



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PARTICLE IMPINGEMENT MATERIAL DISCRIMINATION



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- CURRENT STATUS
 - Solid Fuel Torch developed as low cost materials test bed
 - Standard operating parameters characterized
 - Supersonic Blast Tube developed for evaluating particle impingement sensitivity of materials
 - SFT/SSBT testing implemented in Rayon Replacement program for candidate screening